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(54) APPARATUS AND METHOD FOR DELIVERING SIGNATURES TO A FEED MECHANISM

(71) We, HARRIS CORPORATION, a corporation organised and existing under the laws of the State of Delaware, United States of America of 55 Public Square, Cleveland, Ohio 44113, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement—:

The present invention relates to an apparatus and method for delivering signatures to a feed mechanism.

The invention, the scope of which is defined in the appended claims, provides apparatus for delivering signatures to a feed mechanism, said apparatus comprising means defining a discharge area for signatures from which said signatures are fed by said feed mechanism, means for receiving signature and means for conveying such signatures in a generally vertically stacked on-edge array to said discharge area, side guide means extending in the direction of movement of said conveying means defining a storage area for signatures upstream of said discharge area and arranged to bow each signature in the storage area in the direction of movement of said conveying means, respective hold-release means adjacent the end of said storage area each for engaging a respective one of opposite side edges of the furthest downstream signature in the storage area to sequentially hold that signature in a bowed condition and to release that signature to said discharge area at a predetermined hold-release frequency, and means for operating said hold-release means at said predetermined frequency.

The invention also includes a method for delivering signatures to a feed mechanism comprising the steps of providing a discharge area for discharge of signatures to said feed mechanism, receiving signatures in a generally vertical on-edge array at a location spaced from said discharge area, forming a bow in said signatures to provide stability therefor, conveying said

bowed signatures on edge toward said discharge area, locating movable members to restrain the side edges of said signatures and to maintain said bow in said signatures, removing said members to release said signatures, conveying a released signature to said discharge area, and repeating said steps of locating and removing said members at a predetermined frequency.

In order that the invention may be well understood an embodiment thereof will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a side elevational view of apparatus for delivering signatures to a feed mechanism;

Figure 2 is a view of the apparatus on the line 2—2 of Figure 1; and

Figure 3 is a schematic diagram of the control circuit for the restrictor pins of the apparatus.

Referring now to the drawing, there is illustrated in Figure 1 a hopper 10 which is fed by a hopper loader 12 and which delivers signatures S to a gatherer feed mechanism 14. This gatherer feed mechanism 14 may be of the type disclosed in U.S. Patent Specification No. 3,809,384.

The hopper loader 12 includes means for receiving signatures comprising a horizontal in-feed conveyor 16 which advances on-edge signatures toward an inclined conveyor 20 leading to the hopper 10. The conveyors 16 and 20 are driven by a common drive means 22. The signatures S on horizontal conveyor 16 are conveyed in a vertical array to inclined conveyor 20 in the manner disclosed in U.S. Patent Specification No. 3,904,161. At the entrance to inclined conveyor 20 the signatures are permitted to fall forward. This converts the signatures from the on-edge series to a lapped or shingled stream on conveyor 20. The signatures are then fed to and between a pinch roller 24 and a speeder roller 25 which accelerates and projects each signature upwardly between a stop plate 27 and a jogger table 28.

The signatures S are moved by the re-

ciprocating movements of jogger table 28 and the downward inclination of the jogger table and stop plate 27 between side guide means which comprise side guides 38 and 40, which are parallel and spaced apart a distance less than the width of a signature in a flat or unbowed condition. The signatures are thus bowed in their direction of movement by the side guides and maintained in this condition to promote stability of the signatures in their vertical, on-edge, stacked array.

The signatures are advanced from a storage area of the hopper, which is generally defined by the longitudinal extent of the guides 38 and 40, to a discharge area generally defined as being forward of the guides 38, 40, behind a stop plate 42 and between hopper side frames 44 and 45. The side frames 44, 45 are spaced apart a distance which is generally equal to the width of the signatures in their flat condition.

The signatures S are moved from the storage area to the discharge area by a chain conveyor 46, which extends parallel to the guides 38, 40. As the signatures S are conveyed toward the discharge area, their mid-portions are pulled by the conveyor chains 46 while their vertical side edges drag along the guides 38 and 40 until each signature as it becomes the furthestmost downstream signature in the storage area is intermittently retarded by hold-release means comprising solenoid-operated, extendible and retractable pins or movable members 48 and 50 which extend through the guides 38 and 40. Intermittent retraction of the pins 48 and 50 is timed so that individual signatures S are admitted to the discharge area by permitting the pins to release both side edges of a signature simultaneously to permit the signatures to flatten out and enter the discharge area. The side edges of each succeeding signature are released in sequence to permit those signatures to enter the discharge area. As shown in Figure 2, the spacing of the pins 48, 50 from the entrance to the discharge area is such that the bow in the signatures S projects toward and assists in supporting the flat signatures in the discharge area.

Means for operating the hold-release means at a predetermined frequency is provided by a variable rate pulse generator 54 in the circuit shown in Figure 3. The pins 48, 50 are normally extended and are retracted for a period and at intervals determined by the selected pulse width and frequency or repetition rate of pulses from pulse generator 54. The pulses energize solenoids 56 and 58 to retract pins 48 and 50, respectively, through an on-off switch 60 and contacts 62a and 64a of sensing means which are here photodetector relays 62 and 64. The photodetectors 62 and 64

are mounted on each side of the conveyor 46 between the storage area and the discharge area that is at the entrance to the discharge area as shown in Figure 2. Each detector has its own light source and is aimed at a reflective target 66, 68 supported below the plane of the bottom edge of signatures S and inwardly of side guides 38, 40. The detectors 62, 64 are aimed downwardly and inwardly toward their respective targets.

If the light path between a detector and its target is interrupted by a side edge of a signature either when a signature has escaped past a pin 48, 50 or when the discharge area is filled with signatures, the detector will operate its contacts. As is evident from Figure 3 this will override the operating means and interrupt the energization path of the associated solenoid 56 or 58 and cause the corresponding pin 48, 50 to extend or remain extended. Thus, when the discharge area becomes filled with signatures the light paths to both detectors 62, 64 will be blocked causing the pins 48, 50 to remain extended in a hold condition until the endmost signatures are extracted and conveyor 46 moves the remaining signatures farther into the discharge area and the light paths are unblocked.

As shown in Figure 3, the photo-detectors 62 and 64 independently control their associated pin solenoids 56 and 58. Accordingly, if only one side edge of a signature is released during the predetermined hold-release pattern, only one light path will be blocked. If, for example, only the light path to detector 62 is blocked then only pin 48 will be held in an extended position, while pin 50 will continue to operate at its predetermined frequency to ensure that the other side edge of the signature will be released. This feature prevents the signatures from becoming skewed in the hopper.

Signatures S are extracted from the discharge area by an extractor drum of the gatherer feed mechanism 14 in the manner described in U.S. Patent Specification No. 3,809,384. The signatures are then opened and deposited upon a saddle by a transfer drum and an opener drum as described in the aforementioned patent.

It will be seen that the above described apparatus and method for delivering signatures to a feed mechanism provides for stable orientation of the signatures in the discharge area of a hopper by preventing them from remaining skewed diagonally between the side guides. This improvement saves the significant cost of manual labour which was hitherto employed to check that the multiplicity of hoppers required in a gathering operation were each feeding

correctly.

WHAT WE CLAIM IS:—

1. Apparatus for delivering signatures to a feed mechanism, said apparatus comprising means defining a discharge area for signatures from which said signatures are fed by said feed mechanism, means for receiving signatures and means for conveying such signatures in a generally vertically stacked on-edge array to said discharge area, side guide means extending in the direction of movement of said conveying means defining a storage area for signatures upstream of said discharge area and arranged to bow each signature in the storage area in the direction of movement of said conveying means, respective hold-release means adjacent the end of said storage area each for engaging a respective one of opposite side edges of the furthest downstream signature in the storage area to sequentially hold that signature in a bowed condition and to release that signature to said discharge area at a predetermined hold-release frequency, and means for operating said hold-release means at said predetermined frequency.

2. Apparatus as claimed in claim 1, further comprising means to override said operating means to prevent release of a signature side edge when a corresponding side edge of a preceding signature is adjacent the entrance to said discharge area.

3. Apparatus as claimed in claim 2, wherein said means to override said operating means includes signature sensing means on each side of said conveying means between said storage area and said discharge area.

4. Apparatus as claimed in claim 3, wherein each of said signature sensing means is associated with and overrides one of said hold-release means independently of the other hold-release means.

5. Apparatus as claimed in claim 3 or 4, wherein said signature sensing means comprises a photodetector relay on each side of said conveyor for detecting a side edge of a signature between said storage area and said discharge area.

6. Apparatus as claimed in any one of the preceding claims, wherein each hold-release means comprises a pin extending into said storage area on a respective side thereof.

7. Apparatus as claimed in claim 6

when dependent on claims 3, 4 or 5, wherein each of said signature sensing means is associated with the one of said pins on the same side of said conveyor and is arranged to prevent said pin from releasing further signature when a signature side edge is sensed.

8. Apparatus as claimed in claim 6 or 7, wherein said means for operating said hold-release means comprises a solenoid for operating each pin and means for energizing said solenoids at a predetermined frequency.

9. A method for delivering signatures to a feed mechanism comprising the steps of providing a discharge area for discharge of signatures to said feed mechanism, receiving signatures in a generally vertical on-edge array at a location spaced from said discharge area, forming a bow in said signatures to provide stability therefor, conveying said bowed signatures on edge toward said discharge area, locating movable members to restrain the side edges of said signature and to maintain said bow in said signatures, removing said members to release said signatures, conveying a released signature to said discharge area, and repeating said steps of locating and removing said members at a predetermined frequency.

10. A method as claimed in claim 9, further comprising the steps of sensing a signature side edge at the entrance to said discharge area downstream of said restrained signatures and preventing the release of said restrained signatures on the side thereof corresponding to said sensed signature side edge in response to said sensing.

11. A method for delivering signatures to a feed mechanism substantially as herein described with reference to the accompanying drawings.

12. Apparatus for delivering signatures to a feed mechanism substantially as herein described with reference to the accompanying drawings.

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COMPLETE SPECIFICATION

2 SHEETS

*This drawing is a reproduction of
the Original on a reduced scale*
Sheet 1

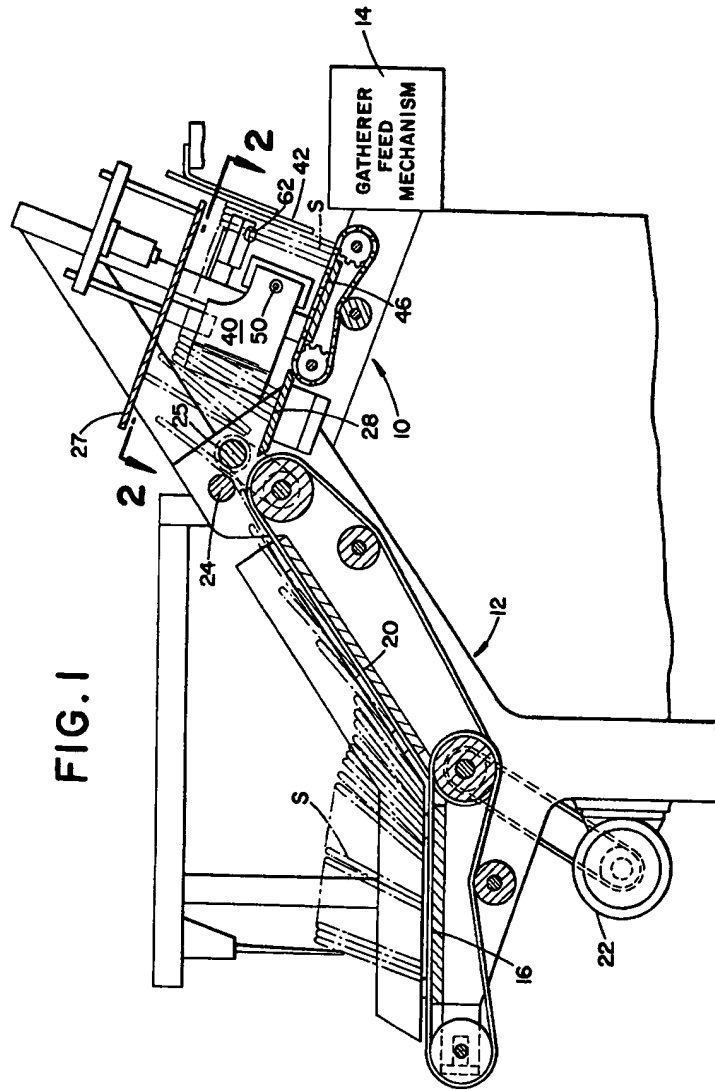


FIG. 2

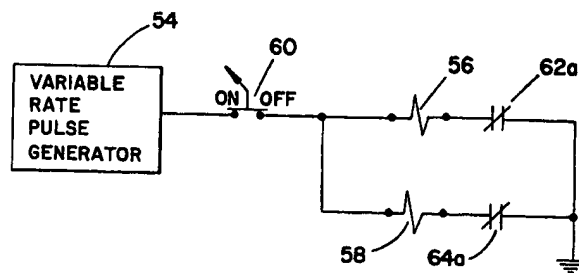
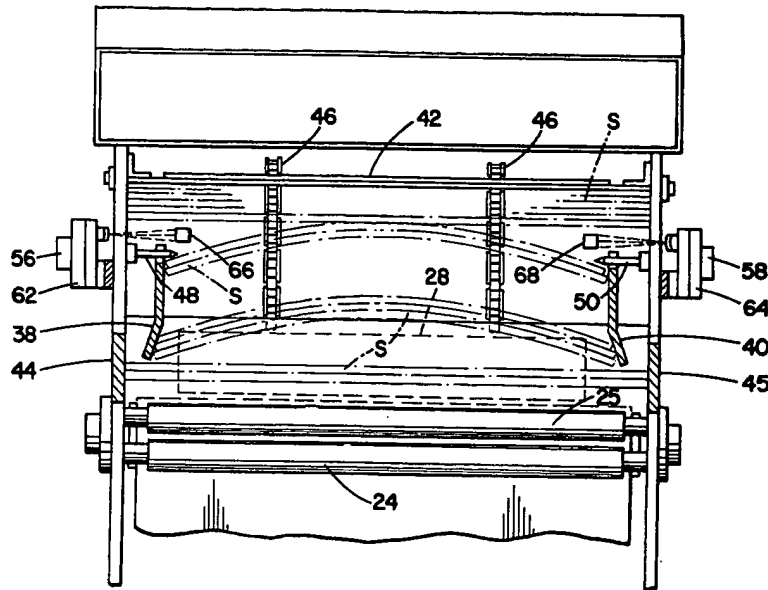


FIG. 3